Headquarters U.S. Air Force

COHORT:

An Integrated Approach to Decision Support for Military Subpopulation Health Care

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U.S. AIR FORCE

Integrity - Service - Excellence

Report Documentation Page

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U.S. AIR FORCE

Transformation…

Builds on experience…

Matures what we have…

Develops what we need!

EOS

Operations Enhanced

Spans Operational Continuum

Transformational Technologies

Transformational Technologies

Standard of Care

Decision Quality Information

Force Protection

COHORT

Composite Occupational Health and Operational Risk Tracking

Transformational Technologies

COHORT

CBS

Improved Situational Awareness

Integrity - Service - Excellence

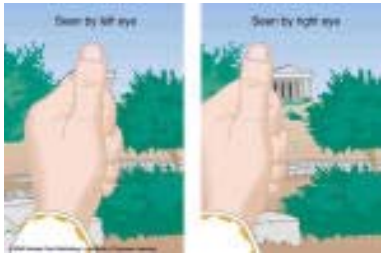
COHORT

Composite Occupational Health and Operational Risk Tracking

U.S. AIR FORCE

Overview

- What is COHORT?
- What is Parallax?
  - Why COHORT is different.
- Does it Work?
  - A Case Study.
- How did we do it?
- Other applications in medical research.



par·al·lax (p r -l ks)n.

1. The apparent displacement of an object caused by a change in the position from which it is viewed.

2. (Astron.) The apparent difference in position of a body (as the sun, or a star) as seen from some point on the earth's surface, and as seen from some other conventional point, as the earth's center or the sun.

U.S. AIR FORCE

What is COHORT?

- **Composite Occupational Health & Operational Risk Tracking**
  - **A series of relevant database that have been consolidated into a datamart that allow for the continuous monitoring, analysis and early detection of epidemics, disease trends, and health anomalies among and across an infinite selection of cohorts though a variety of data applications**
  - **Provides temporal and geographic medical surveillance of every Air Force member from induction through retirement**

Parallax to Surveillance Perspectives

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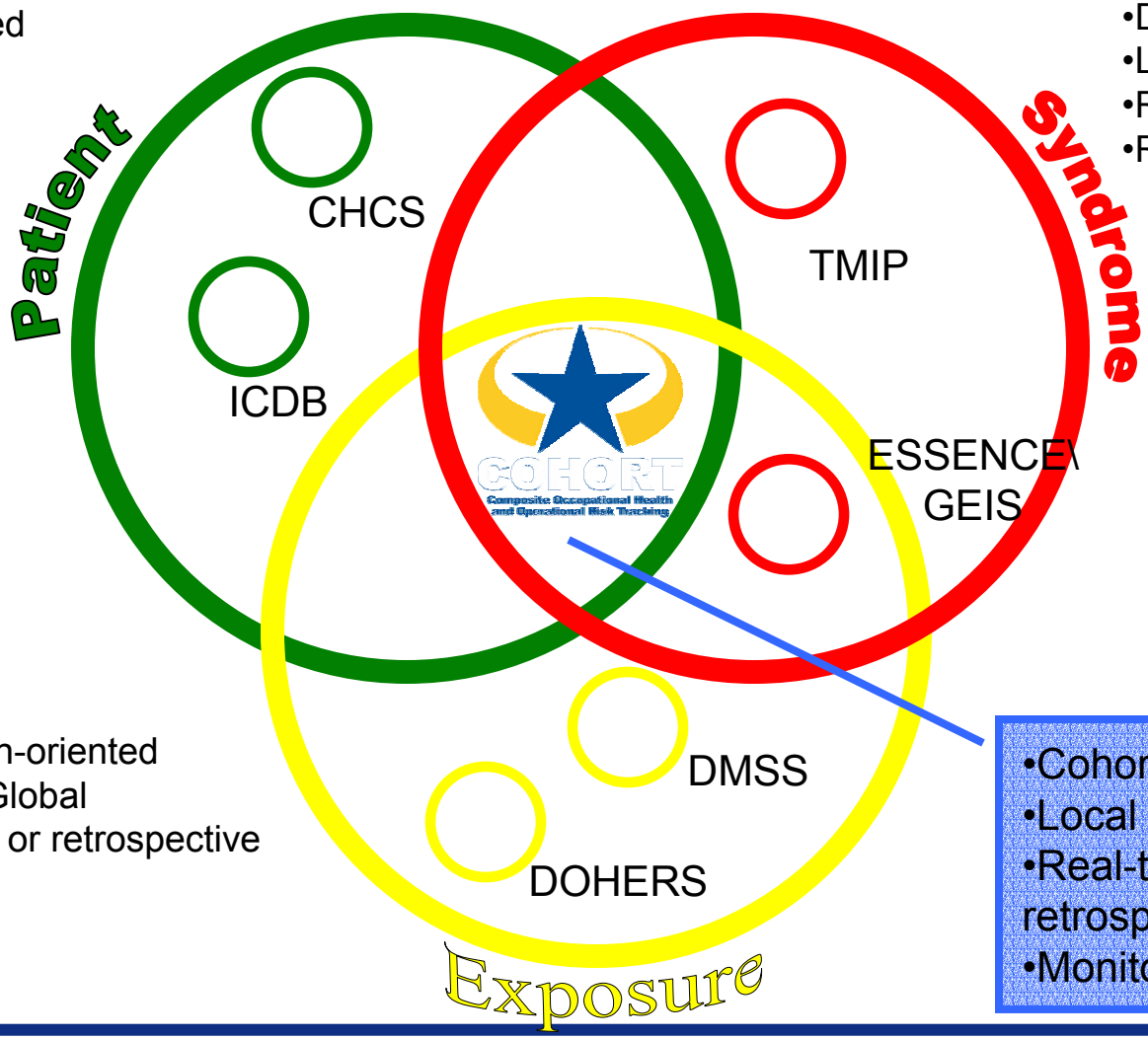
- Patient-oriented
- Local
- Real-time

- Disease-oriented
- Local or Global
- Real-time
- Retrospective



- Population-oriented
- Local or Global
- Real-time or retrospective

- Cohort-oriented
- Local or Global
- Real-time or retrospective
- Monitor ANY Cohort


Operational
Assignment
Deployment
Re-Deployment
Occupational

U.S. AIR FORCE

Troop Exposure

- Exposure to Nuclear Testing
- Agent Orange
- Gulf War Syndrome?
- Operation Iraqi Freedom?
- Occupational Hazards
  - Noise
  - Chemical
  - Work Injury
  - Directed Energy

COHORT Case Study

U.S. AIR FORCE

How Do We Know The Data Are Accurate?

"**. . .Since 2002, military health officials have reported 22 cases of the disease, with the majority being reported . . .**"

- Tyndall AFB, Florida, Gulf Defender, Vol. 62, No 41, Oct 24, 2003

Oct. 24, 2003 **Gulf Defender** Page 5

AF halts certain blood donations

ARMY SGT. 1ST CLASS DOUG SAMPLE
American Forces Press Service

WASHINGTON (AFPN) — A parasitic disease being spread by sand flies in Iraq has prompted officials who oversee the military's blood supply to implement a one-year donor deferral for military people serving in that country.

The reason for the deferral is a form of the disease Leishmaniasis which causes sores or lesions on the skin, and which in its most serious form can cause death. Since 2002, military health officials have reported 22 cases of the disease, with the majority being reported this year.

"It's a cautious deferral; we're erring on the side of safety," said Lt. Col. Ruth Sylvester, director of the armed services blood program office. "People who actually get the disease are permanently deferred," she explained. "The issue with those who are exposed is that there is an incubation period before any symptoms appear — the deferral will prevent them from unknowingly donating (infected) blood."

According to blood program officials, the parasite that causes the disease has been proven to survive in blood products stored under standard conditions for up to 25 days. At least six transfusion-transmitted cases of the disease have been reported.

Colonel Sylvester, who said she is not a physician but understands the disease, said there are two types of Leishmaniasis. The most common, but less serious, form is cutaneous Leishmaniasis, which causes lesions on the skin that may look like a volcano with a raised edge and center "crater" and may be covered with a scab, she said.

"All of the military cases so far have been cutaneous," she added. However, she said the more serious form of the disease, visceral Leishmaniasis, can affect the internal organs of the body, such as the spleen and liver, and can lead to death.

Colonel Sylvester said military people who have been infected with the disease are being treated at Walter Reed Army Medical Center here, where doctors have set up a special-treatment program just for the disease. People infected with the disease undergo a three-week drug regimen that "will eliminate the disease and take care of the infection," she said.

"I don't believe there is cause for alarm," Colonel Sylvester said. "We had 22 cases in the last two years with all the people we've had deployed in Afghanistan and Iraq and throughout the entire Central Command area. So it's a very small number, given the total number of people deployed."

But she did express concern about the disease's impact on the number of eligible military blood donors. The latest deferral is just one of many the military's blood program is now facing, she said.

In recent years, blood-program officials had to defer donors because of malaria risks worldwide. They also had to defer people who might (have) been exposed to a variant of Creutzfeldt-Jakob disease, better known as "mad cow" disease, or who lived in certain parts of Europe for specified time periods between 1980 and 1996.

"When we lose these donors, we have to bring in more donors," Colonel Sylvester said. "We have to find donors who have not traveled, not been deployed, and haven't lived in Europe. It's imperative that we find donors who have not deployed, and we're focusing our efforts on bringing those donors in."

Colonel Sylvester said the military has plenty of eligible donors to draw from, and she encouraged military and Department of Defense employees, as well as family members, to donate blood on a regular basis by scheduling appointments with local DOD donor centers. Where the DOD does not have donor centers, she encourages donations to local civilian agencies.

"In the DOD blood program, we only touch a very small percentage of the population that we draw from — about 20 percent of the eligible donors," she said. "So there are plenty of donors out there. The (challenge are) to get them in the door and to get them to donate."

Peacetime MAJCOM	Peacetime Installation	Career Field	Gender	# Coded Diagnoses
AF Special Operations Command (0V)	MOODY	12 (Navigator)	M	91
Air Combat Command (1C)	EGLIN	2E (Communications Electronics Systems)	M	37
Air Combat Command (1C)	EGLIN	3E (Civil-Engineering)	M	28
Air Combat Command (1C)	ELLSWORTH	3M (Services)	M	28
Air Education and Training Command (0J)	LUKE	2G (Logistics Plans)	F	28
US Air Force Europe (0D)	SPANGDAHLEM	1C (Command Control Systems Operations)	M	28
AF Materiel Command (1M)	WRIGHT PATTERSON	3A (Information Mangement)	M	28
Air Mobility Command (1L)	ANDREWS	2T (Transportation and Vehicle Maintenance)	M	21
Air Mobility Command (1L)	CHARLESTON	2A (Manned Aerospace Maintenance)	M	14
US Air Force Europe (0D)	LIVORNO	2W (Munitions and Weapons)	F	14
Air Mobility Command (1L)	CHARLESTON	21 (Description(?))	M	7
AF Materiel Command (1M)	EDWARDS	3P (Security Forces)	M	7
AF Element, US Central Command (3C)	MACDILL	3P (Security Forces)	M	7
AF Space Command (1S)	MALMSTROM	3M (Services)	F	7
AF Office of Special Investigations (07)	ANDREWS	3U (Manpower)	M	7
11th Wing (2W)	BOLLING	6C (Contracting)	M	7
AF Materiel Command (1M)	KIRTLAND	3P (Security Forces)	M	7
Air Education and Training Command (0J)	LACKLAND	2E (Communications Electronics Systems)	M	7
Air Combat Command (1C)	ROBINS	3A (Information Mangement)	F	7
AF Space Command (1S)	MALMSTROM	3A (Information Mangement)	F	6
AF Element, Europe (3G)	BRUNSSUM	9A (Awaiting Discharge/Retraining)	M	2
AF Space Command (1S)	MALMSTROM	5J (Paralegal)	F	1

Queries on the COHORT database match compulsory reportable incidences of occurrence

U.S. AIR FORCE

Current Duty Status of Infected Cohort

Actual Cases by SSN (Masked)				
Deployment Year	Deployed Location	SSN	Deployed (Y/N)	Current Duty Location
2003	IRAQ	148******	N	ROBINS
2003	IRAQ	233******	N	SPANGDAH
2003	IRAQ	292******	N	WRIGHT PAT
2003	IRAQ	300******	N	OSAN
2003	OTHER	218******	N	LUKE
2000	OTHER	101******	N	OSAN
2001	OTHER	245******	N	SCOTT
2003	OTHER	249******	N	LACKLAND
2000	OTHER	258******	N	CHARLEST
2002	OTHER	356******	N	ELLSWORT
2003	OTHER	377******	N	ANDREWS
2003	OTHER	434******	N	EGLIN
2000	OTHER	522******	N	MALMSTRO
2003	OTHER	530******	N	UNK
2003	OTHER	573******	N	MOODY
2003	OTHER	576******	N	MACDILL
2001	OTHER	589******	Y	CONUS
2003	OTHER	640******	Y	OCONUS
2003	OTHER	985******	N	UNK

U.S. AIR FORCE

Who Else May Be Infected?

CASE #1	
FRN	FG7WC
Deployed Country	Iraq
Deployed State	Kirkuk
# Males	10
# Females	2
Date Arrived Theater	5/7/2003 to 5/9/2003
Air Force Career Group	Operations

Infected Troop

CASE #2	
FRN	AU1N3
Deployed Country	Iraq
Deployed State	Tallil
# Males	32
# Females	8
Date Arrived Theater	4/19/2003 to 4/24/2003
Air Force Career Group	Logistics and Support

Infected Troop

CASE #3	
FRN	FW43J
Deployed Country	Iraq
Deployed State	Kirkuk
# Males	5
# Females	0
Date Arrived Theater	37730
Air Force Career Group	Support

Case For Preventive Intervention?

U.S. AIR FORCE

Leishmaniasis, US Armed Forces, 2003

Leishmaniasis is an arthropod-transmitted zoonotic disease that is caused by protozoa of the genus *Leishmania*.[1,2,3] Leishmania parasites are transmitted through bites of infective female sand flies (*Lutzomyia* species in the Americas and *Phlebotomus* species elsewhere).[4] The disease is endemic in many areas of Asia, Africa, the Middle East, South and Central America, and southern Europe.[1-6]

The clinical expressions of leishmaniasis are highly variable and primarily dependent on the infecting leishmania species and host immune responses.[1,3] Cutaneous, mucosal, and visceral leishmaniasis, the three major clinical forms, are manifestations of skin, naso-oropharyngeal mucous membrane, and systemic infections, respectively.[1,3] The courses of cutaneous and mucosal leishmaniasis are characterized by papules that progress to nodules and eventually to ulcers (which are often multiple and can be disfiguring). The manifestations of visceral leishmaniasis (which can be life threatening) include fever, weakness, hepatosplenomegaly, pancytopenia, hyperglobulinemia, and emaciation.[1-3,7,8] Not all infected persons develop signs or symptoms of leishmaniasis; but among those who do, times from infection to first clinical manifestations generally range from a week to many months, with much longer periods (e.g., up to 10 years) for visceral infections.[1-3,9]

U.S. military personnel are exposed to risks of leishmaniasis during training and operations in endemic areas.[2,4-6] Of recent and ongoing concern, leishmaniasis is endemic in many areas of Iraq, Afghanistan, and Kuwait. During the past year, surveillance of female phlebotomine sand flies in areas of Iraq where the U.S. military operated revealed an overall infection rate (among nearly 24,000 female sand flies) of 1.4%.[2]

This report summarizes frequencies, rates, and demographic and military characteristics of U.S. servicemembers who were diagnosed/reported with leishmaniasis during calendar year 2003. The leishmaniasis experience in 2003 is compared to experiences of past years.

Methods. We defined three surveillance periods: (1) January-December 2003; (2) January 1999–December 2002; and (3) January 1990–December 1991. We searched records in the Defense Medical Surveillance System (DMSS) to identify all reportable medical events, hospitalizations, and ambulatory visits during the surveillance periods with diagnoses of leishmaniasis (ICD-9-CM: 085.0-085.9). (Hospitalization records were the only records available for the 1990-1991 period.) Only one episode of leishmaniasis per person per year was included. Demographic and military characteristics were ascertained for all affected members of the active and Reserve components of all Services, but incidence rates were calculated for the active components only. Histories of international travel were self-reported. Only one follow-up visit (defined as a hospitalization or ambulatory visit at least one day after a diagnosis) per person per day was included.

Results. In 2003, there were 400 incident diagnoses/reports of leishmaniasis among members of the U.S. Armed Forces. All but one of the cases were reported as "cutaneous leishmaniasis." Approximately one-fourth (n=105, 26%) of all cases were Reserve component members (table 1).

The median age of cases was 27 years (range: 18-57 years). Most cases reported service in Iraq and/or Kuwait.

In the active components of the Services, the overall incidence rate of leishmaniasis in 2003 was 20.9 per 100,000 person-years (p-yrs). The rate was higher by far in the Army (55.2 per 100,000 p-yrs) than the other Services (table 1). The incidence rate was nearly four times higher among men than women; and the rate was higher among servicemembers who were non-Hispanic White than non-Hispanic Black, Hispanic, or "all other" race-ethnicities (table1, figure 1). During 2003, the rate of diagnosis of leishmaniasis was highest in the autumn and peaked in September (53.2 new diagnoses per 100,000 p-yrs) (figure 2).

Among cases (n=235) who had documented medical encounters following their initial diagnoses, the median number of follow-up visits was 10 (range: 2-26 visits). Only one percent of all cases were hospitalized (data not shown).

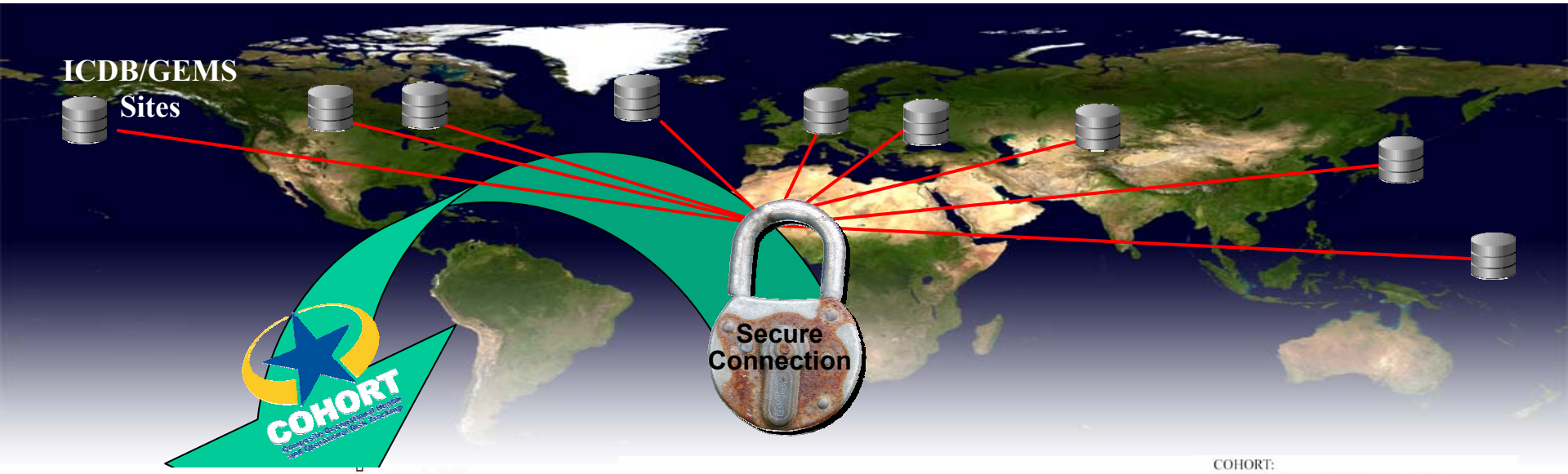
Not all infected persons develop signs or symptoms of leishmaniasis; but among those who do, times from infection to first clinical manifestations generally range from a week to many months, with much longer periods (e.g., up to 10 years) for visceral infections.

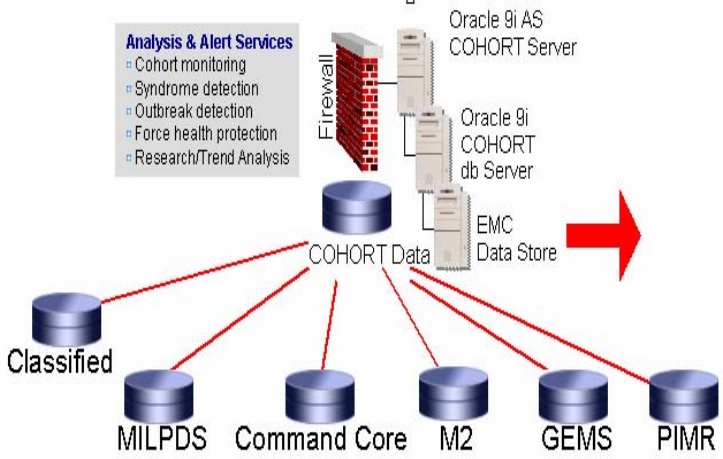
?? **Could there be "hidden" or latent cases of Leishmaniasis among other documented disease categories?** ??

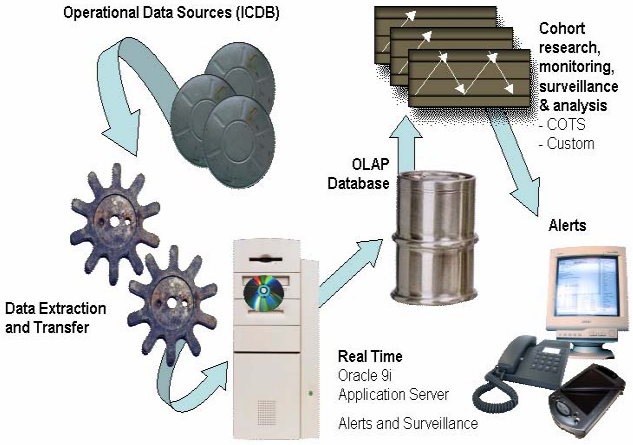
ABNORMAL BLOOD FINDINGS*	23
CONTACT DERMATITIS*	534
HAIR & FOLLICLE DISEASE*	355
OTH LOCAL SKIN INFECTION*	32
OTH SKIN HYPERTRO/ATROPH*	83
OTHER ABNORMAL FINDINGS*	165
OTHER CELLULITIS/ABSCESS*	223
OTHER SKIN DISORDERS*	201
SEBACEOUS GLAND DISEASE*	455
SKIN/OTH INTEGUMENT SYMP*	454

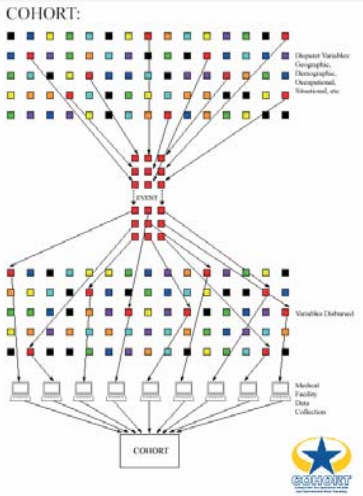
COHORT Operations

U.S. AIR FORCE



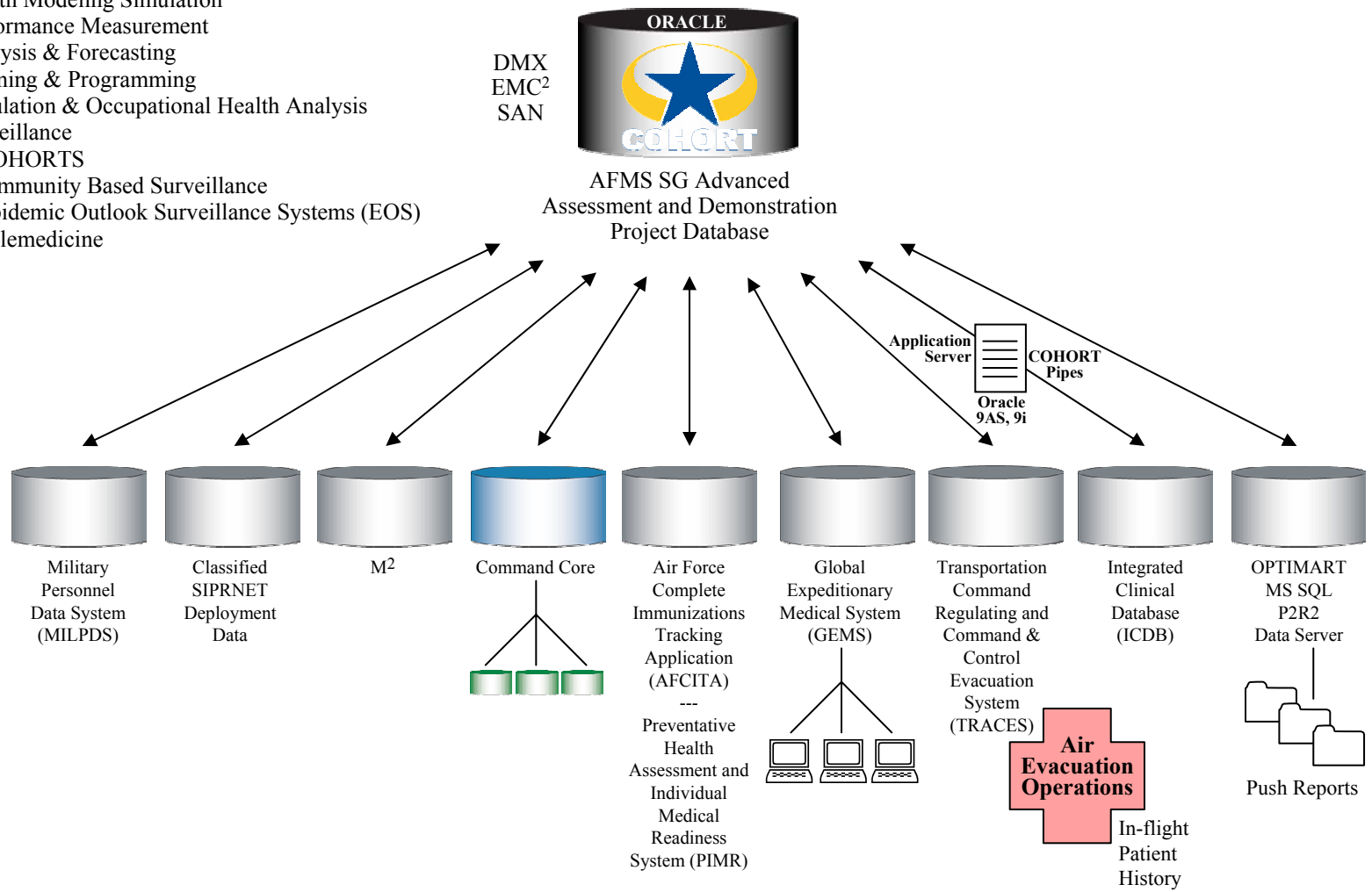




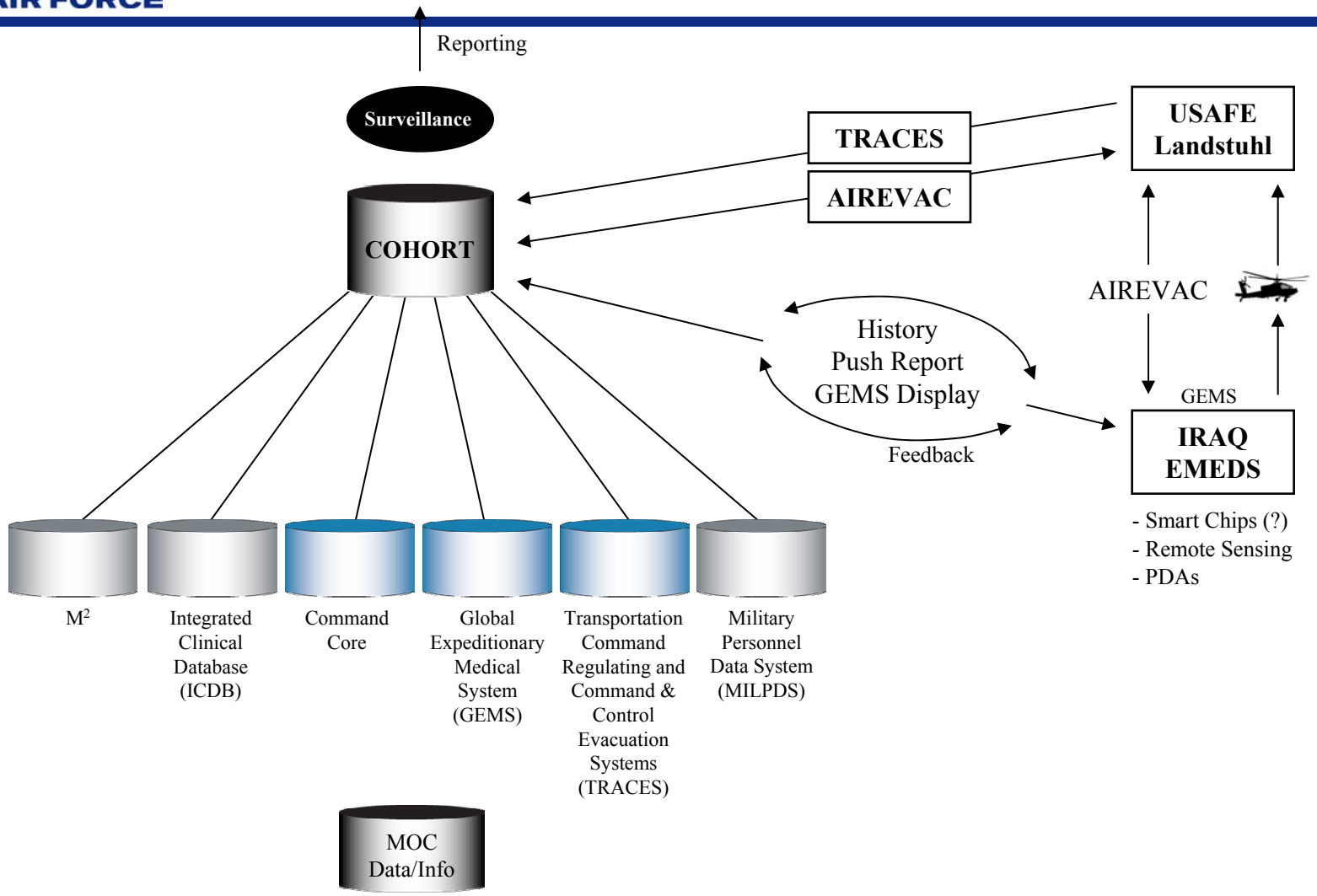


Supported Activities

- Health Modeling Simulation
- Performance Measurement
- Analysis & Forecasting
- Planning & Programming
- Population & Occupational Health Analysis
- Surveillance
  - COHORTS
  - Community Based Surveillance
  - Epidemic Outlook Surveillance Systems (EOS)
  - Telemedicine



Patient Tracking and Clinical Feedback Model (PTCFM)



Community Based Surveillance

Enable USAF Surgeon General to consolidate, monitor, extract, and analyze **real-time** medical data from all military health care facilities for earlier detection of epidemics, disease trends, and health anomalies

- Pattern Analysis
- Algorithm Development
- Programmed Alerting
- Protocol Standardization

Advanced Diagnostics

EOS Operations and Deliverables

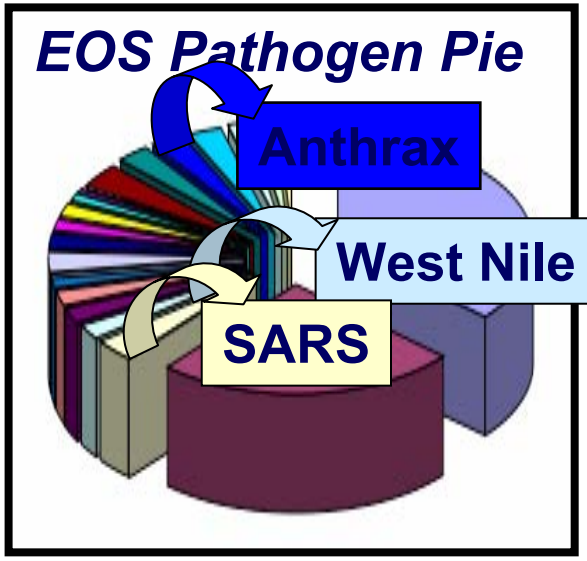
U.S. AIR FORCE

Respiratory Pathogen Microarray (RPM)

Z-chip from concept to delivery
(Operational from 07 Jun 2003)
Common and biowarfare agents
Iterative design and process
Delivery, evaluation, and validation

Common Pathogens

- Adenovirus
- Influenza
- Coronavirus
- West Nile
- Parainfluenza
- RSV
- Rhinovirus
- Strept. pyogenes
- Chlam. pneumoniae
- Myco . pneumoniae
- Bord. pertussis
- Neiss. meningitidis
- Strept. pnemoniae



Biowarfare Pathogens

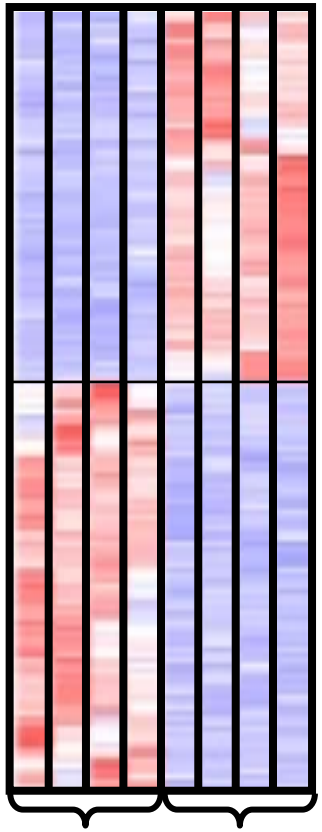
- Smallpox
- Anthrax
- Plague
- Tularemia
- Ebola Virus
- Lassa Fever

Host Response Gene Expression Profiles

Up to 500,000 diagnostic tests per chip

Over 30,000 human genes per test

Real Data ➡



Healthy *Sick (FRI)*


EOS
COHORT
COHORT
CBS
Transformational Technologies
Improved Situational Awareness


UNITED STATES AIR FORCE
MEDICAL SERVICE